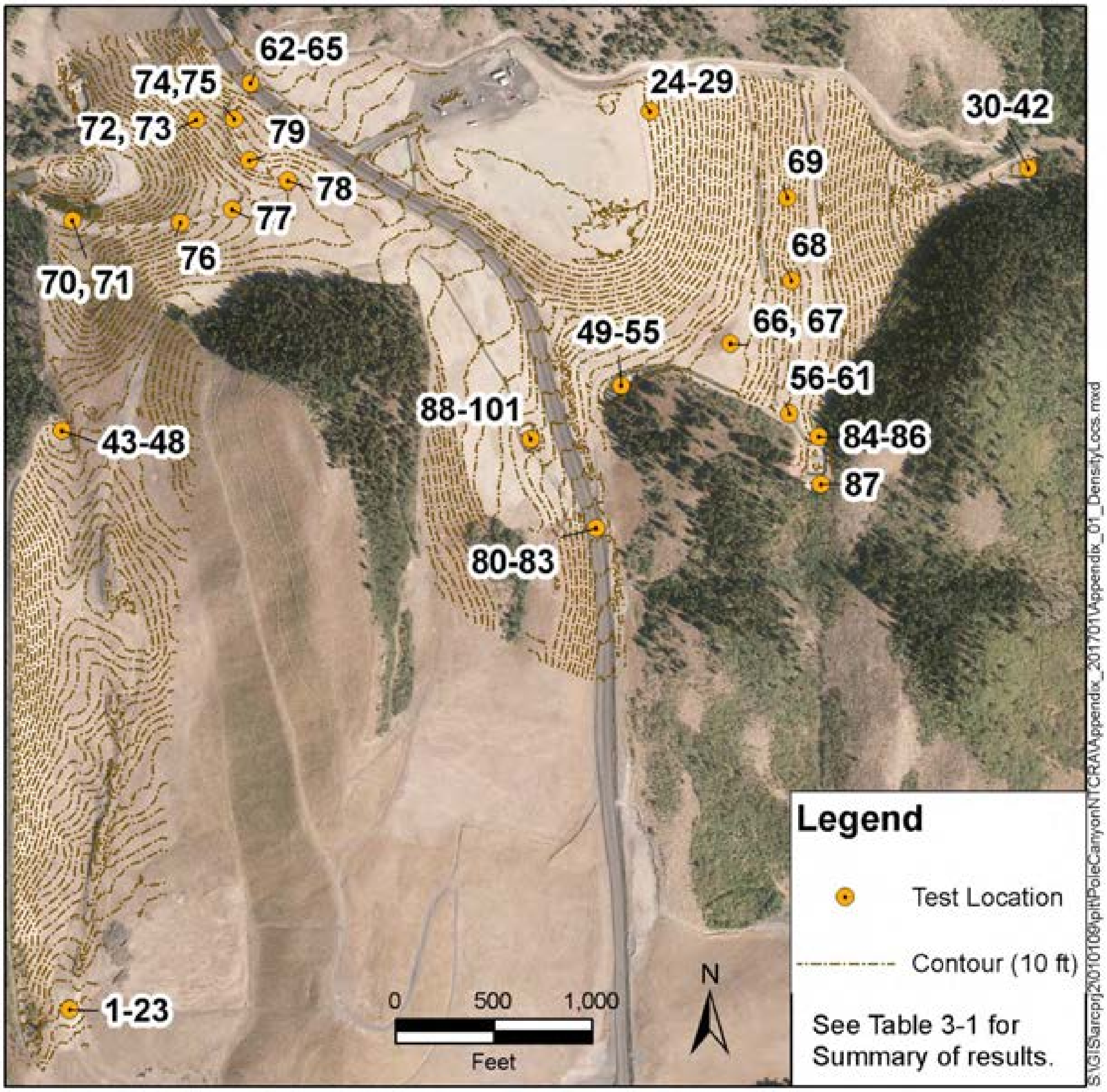

Figure H-1. Compaction Testing Locations

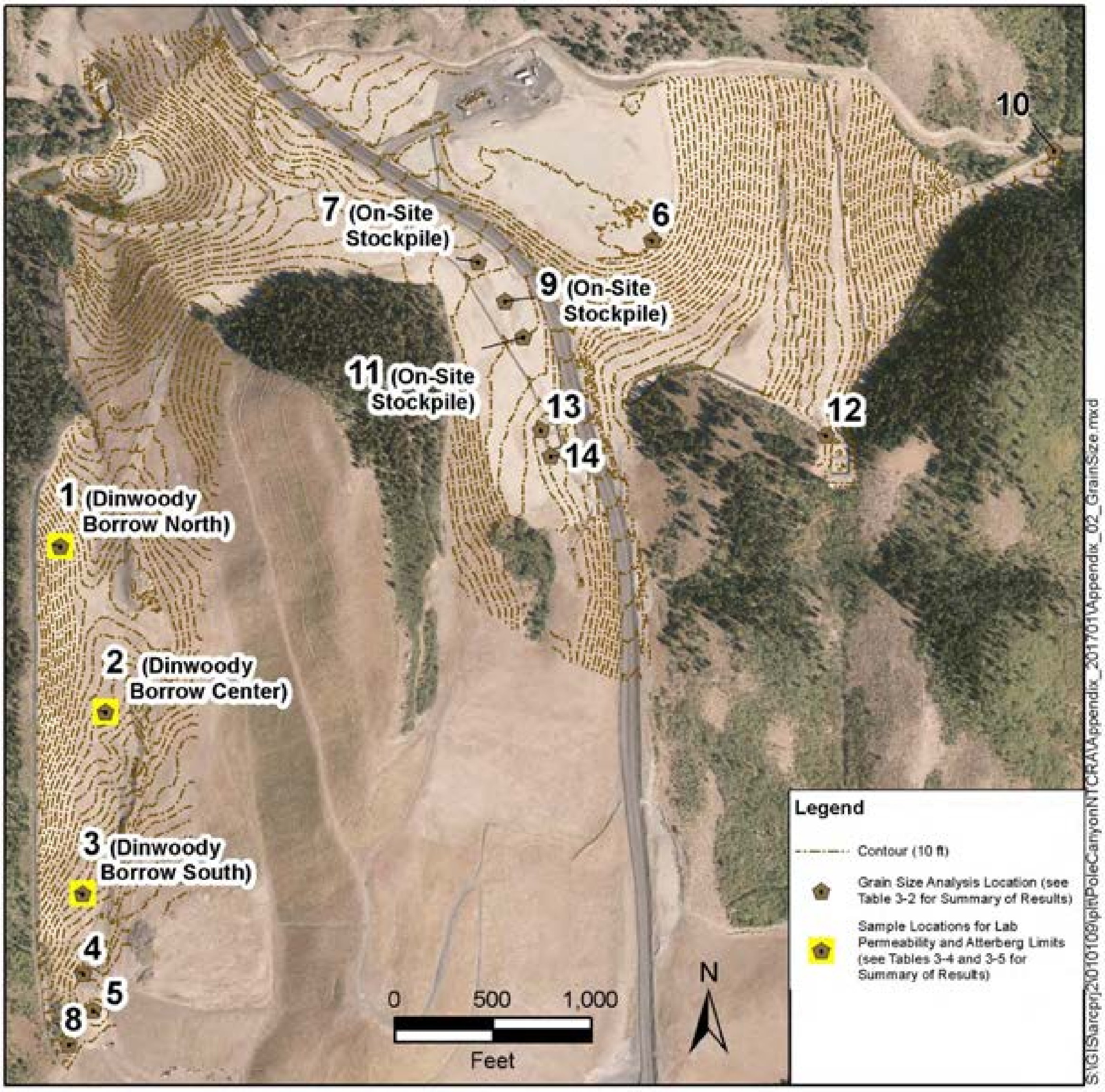

Figure H-2. Locations of Sample Collection for Grain Size Analysis, Lab Permeability, and Atterberg Limits

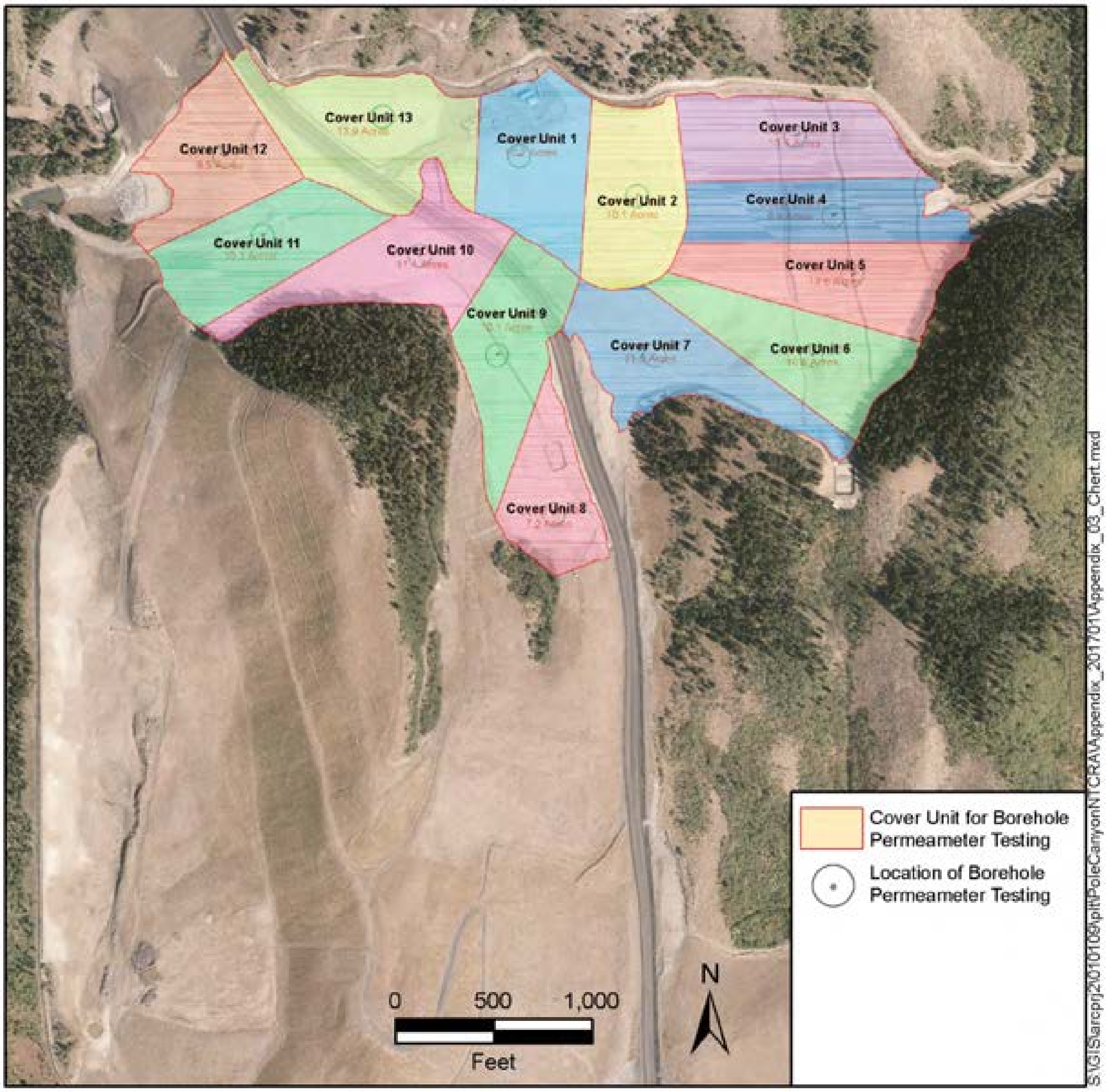

Figure H-3. Field Permeability (Borehole Permeameter) Testing Locations

Table H-1. Summary of Density Testing Results

Location	Test Date	Density Test Location Identifier (for map Figure H-1)	Station/Description	Type	Wet Density (pcf)	Dry Density (pcf)	Percent Moisture	Percent Maximum Density Obtained	Maximum Dry Density (pcf)	Notes
Dinwoody Borrow South Sedimentation Basin	4/13/2015	1	1st lift north	QC	140.3	125.9	11.4	97.8	128.8	
	4/13/2015	2	1st lift north	QC	138.3	122.9	12.5	95.4	128.8	
	4/13/2015	3	2nd lift	QC	140.7	125.7	11.9	97.6	128.8	
	4/13/2015	4	3rd lift north	QC	142.6	128.8	10.7	100.0	128.8	
	4/13/2015	5	3rd lift south	QC	137.3	123.1	11.5	95.6	128.8	
	4/22/2015	6	Lift #4	QC	141.4	123.6	14.4	101.1	122.2	
	4/22/2015	7	Lift #5	QC	137.8	118.4	16.4	96.9	122.2	
	4/22/2015	8	Lift #6	QC	136.4	118.9	14.7	97.3	122.2	
	4/22/2015	9	Lift #6 inside	QC	139.0	125.4	10.8	102.6	122.2	
	4/22/2015	10	Lift #7	QC	134.7	116.9	15.2	95.7	122.2	
	4/22/2015	11	Lift #8	QC	138.5	121.6	13.9	99.5	122.2	
	4/22/2015	12	Lift #8 inside	QC	132.1	118.1	11.9	96.6	122.2	
	4/22/2015	13	Lift #9	QC	138.7	122.9	12.9	100.6	122.2	
	4/22/2015	14	Lift 10A outflow east	QC	139.6	122.5	13.9	100.2	122.2	
	4/22/2015	15	Lift 10B outflow west	QC	134.4	118.9	13	97.3	122.2	
	4/22/2015	16	Lift 11A north	QC	138.3	126.4	9.4	103.4	122.2	
	4/22/2015	17	Lift 11B west	QC	143.9	130.6	10.2	106.9	122.2	
	4/22/2015	18	Spillway subgrade, 2 ft upstream CL; FG	QA	131.8	120.3	9.6	95.2	126.3	
	4/22/2015	19	Spillway subgrade, 3 ft downstream CL; FG	QA	135.7	122.4	10.9	96.9	126.3	
	4/22/2015	20	8 ft left of spillway; mid height	QA	143.1	128.2	11.6	101.5	126.3	
	4/22/2015	21	18 ft left of spillway; mid height	QA	129.9	116.0	12.0	91.8	126.3	Failed; basin ponded before retest.
	4/22/2015	22	13 ft downstream CL; 2.5 ft BTE	QA	129.2	115.6	11.8	91.5	126.3	Failed; not retested.
	4/22/2015	23	Pond basin, 30 ft L of Spillway; ET	QA	135.6	123.5	9.8	97.8	126.3	
East Side ODA Cover Initial 1 foot Dinwoody lift	5/6/2015	24	0 passes with compactor	Performance Specification	128.6	109.6	17.3	89.7	122.2	Performance specification performed to determine minimum number of passes required to achieve required density.
	5/6/2015	25	1 pass with compactor		129.2	110.6	16.8	90.5	122.2	
	5/6/2015	26	2 passes with compactor		129.9	111.4	16.6	91.2	122.2	
	5/6/2015	27	3 passes with compactor		128.7	109.6	17.4	89.7	122.2	
	5/6/2015	28	4 passes with compactor		129.3	112.5	14.9	92.1	122.2	
	5/6/2015	29	5 passes with compactor		129.7	112.3	15.5	91.9	122.2	
East Side ODA East Sedimentation Basin	6/26/2015	30	Top 1	QC	128.0	114.2	12.1	98.1	116.4	
	6/26/2015	31	Top 2	QC	129.3	113.9	13.5	97.9	116.4	
	6/26/2015	32	Top 3	QC	130.3	119.5	8.9	102.7	116.4	
	6/26/2015	33	Top 4	QC	129.5	112.9	14.7	97	116.4	
	6/26/2015	34	Top 5	QC	129.2	113.2	14.1	97.3	116.4	
	6/26/2015	35	Embankment 4	QC	128.2	111.1	15.3	95.4	116.4	
	6/26/2015	36	Embankment 3	QC	129.0	112.0	15.2	96.2	116.4	
	6/26/2015	37	Embankment 2	QC	137.3	118.6	15.7	101.9	116.4	
	6/26/2015	38	Embankment 1	QC	133.8	117.9	13.4	101.3	116.4	
	6/30/2015	39	Southeast side of east berm on basin interior	QA	131.4	116.3	13.0	102.6	113.3	
	6/30/2015	40	Center of the east side berm on basin interior	QA	130.0	115.0	13.0	101.5	113.3	
	6/30/2015	41	North side of the east berm on basin interior	QA	139.0	121.9	14.0	96.5	126.3	
	6/30/2015	42	Northeast end of east berm on berm exterior	QA	123.9	112.4	10.2	99.2	113.3	

Table H-1. Summary of Density Testing Results

Location	Test Date	Density Test Location Identifier (for map Figure H-1)	Station/Description	Type	Wet Density (pcf)	Dry Density (pcf)	Percent Moisture	Percent Maximum Density Obtained	Maximum Dry Density (pcf)	Notes
Dinwoody Borrow North Sedimentation Basin	8/3/2015	43	Location #3 @ 7410 ft	QC	126.8	105.3	20.4	97.1	108.5	
	8/3/2015	44	Location #4 @ 7411 ft	QC	119.8	104.8	14.3	96.6	108.5	
	8/3/2015	45	Location #2 @ 7412 ft	QC	127.3	106.3	19.8	98.0	108.5	
	8/3/2015	46	Location #1 @ 7414 ft	QC	126.9	104.4	21.5	96.2	108.5	
	9/2/2015	47	North embankment 10 ft west of spillway centerline; approx 7414 ft	QA	122.9	111.4	10.4	98.3	113.3	
	9/2/2015	48	North embankment 10 ft east of spillway centerline; approx 7414 ft	QA	131.7	120.8	9.0	95.6	126.3	
East Side ODA South Central Sedimentation Basin	9/9/2015	49	Top of embankment @ 7223 ft	QC	125.2	113.9	10.3	97.9	116.4	
	9/9/2015	50	West side of embankment @ 7220 ft	QC	127.8	115.8	10.2	99.5	116.4	
	9/9/2015	51	East side of embankment @ 7221 ft	QC	121.9	110.3	10.4	94.8	116.4	
	9/9/2015	52	East end basin bottom @ 7217 ft	QC	122.9	113.7	8.1	97.7	116.4	
	9/9/2015	53	Center basin bottom @ 7217 ft	QC	121.0	111.2	8.7	95.5	116.4	
	9/9/2015	54	West end basin bottom @ 7217 ft	QC	122.8	112.6	9.1	96.7	116.4	
	9/2/2015	55	Center of east embankment; top lift approx 7223 ft	QA	127.3	114.9	10.9	101.4	113.3	
East Side ODA Energy Dissipation Structure	9/9/2015	56	North end basin bottom @ 7135 ft	QC	128.0	117.3	9.2	100.8	116.4	
	9/9/2015	57	South end basin bottom @ 7134 ft	QC	130.3	118.7	9.8	102.0	116.4	
	9/9/2015	58	West embankment top @ 7142 ft	QC	130.3	118.6	9.9	101.9	116.4	
	9/9/2015	59	North embankment top @ 7141 ft	QC	124.7	115.1	8.3	98.9	116.4	
	9/9/2015	60	South embankment @ 7132 ft	QC	123.7	112.6	9.9	96.7	116.4	
	9/2/2015	61	Center of north embankment; top lift approx 7140 ft	QA	140.7	125.2	12.4	99.1	126.3	
North Haul Road Culvert	9/9/2015	62	North culvert, east end @7137 ft	QC	137.6	127.9	7.5	99.1	129.1	
	9/9/2015	63	North culvert, west end @ 7426 ft	QC	130.0	126.5	3.4	98.0	129.1	
	9/2/2015	64	42-inch diameter culvert crossing mine haul road; west road shoulder, 25 ft east of outlet, south side of culvert	QA	133.3	127.9	4.2	94.5	135.3	
	9/2/2015	65	42-inch diameter culvert crossing mine haul road; west road shoulder, 25 ft east of outlet, north side of culvert	QA	135.2	129.5	4.4	95.7	135.3	
East Side ODA Runoff Ditch	9/21/2015	66	Lift 4 chert	QC	149.0	138.9	7.4	104.6	132.8	
	9/21/2015	67	Lift 4 chert	QC	150.5	141.8	6.1	106.8	132.8	
	9/21/2015	68	East slope upper ditch Sta 31+00 Offset 480 ft R	QC	131.3	115.5	13.7	96.8	119.3	
	9/21/2015	69	East slope upper ditch Sta 31+00 Offset 240 ft R	QC	137.5	124.0	10.9	103.9	119.3	
West Side ODA Runoff Ditch	9/21/2015	70	Lower west side ditch Sta 2+90 Offset 880 ft R	QC	131.3	114.8	14.4	96.2	119.3	
	9/21/2015	71	Lower west side ditch Sta 2+00 Offset 910 ft R	QC	132.8	119.8	10.9	100.4	119.3	
	9/21/2015	72	West slope access road Sta 0+00 Offset 250 ft R	QC	136.2	118.9	14.5	99.7	119.3	
	9/21/2015	73	West slope access road Sta 4+00 Offset 650 ft R	QC	132.6	114.9	15.4	96.3	119.3	
	9/21/2015	74	West slope upper ditch Sta 6+50 Offset 420 ft R	QC	133.8	120.1	11.4	100.7	119.3	
	9/21/2015	75	West slope upper ditch Sta 5+00 Offset 300 ft R	QC	138.3	120.5	14.7	101.0	119.3	
	9/23/2015	76	West ditch final grade 200 ft downstream	QC	138.4	123.2	12.4	101.1	121.9	
	9/23/2015	77	West ditch final grade 100 ft downstream	QC	137.1	122.6	11.9	100.6	121.9	
	9/24/2015	78	West side runoff ditch, 130 ft upstream of EDS 15 ft right of CL	QA	132.4	122.3	14.0	96.8	126.3	
	9/24/2015	79	West side runoff ditch, 225 ft upstream of EDS 15 ft right of CL	QA	136.6	123.5	10.6	97.8	126.3	
South Haul Road Culvert	9/23/2015	80	South culvert final lift offset 24 ft	QC	136.6	129.8	5.2	97.7	132.8	
	9/23/2015	81	South culvert final lift offset 75 ft	QC	150.3	141.1	6.5	106.3	132.8	
	9/24/2015	82	35 ft west of outlet, left of CL	QA	149.5	141.9	5.4	104.9	135.3	
	9/24/2015	83	35 ft west of outlet, right of CL	QA	146.2	139.9	4.5	103.4	135.3	

Table H-1. Summary of Density Testing Results

Location	Test Date	Density Test Location Identifier (for map Figure H-1)	Station/Description	Type	Wet Density (pcf)	Dry Density (pcf)	Percent Moisture	Percent Maximum Density Obtained	Maximum Dry Density (pcf)	Notes
Saddle Infiltration Basin	10/21/2015	84	North embankment; toe	QA	142.9	132.1	8.2	101.6	130.0	
	10/21/2015	85	North embankment; 5 ft below toe	QA	139.8	128.0	9.2	98.5	130.0	
	10/21/2015	86	North embankment; 6 ft below toe	QA	140.3	127.9	9.7	98.4	130.0	
	10/21/2015	87	South embankment; toe	QA	143.2	131.7	8.7	101.3	130.0	
West Side South Sedimentation Basin	11/20/2015	88	West center crest	QC	126.9	113.1	12.2	95.4	118.6	
	11/20/2015	89	West north crest	QC	126.5	114.0	11	96.1	118.6	
	11/20/2015	90	West slope	QC	126.9	113.7	11.6	95.9	118.6	
	11/20/2015	91	South slope	QC	127.2	117.6	8.2	99.2	118.6	
	11/20/2015	92	South crest	QC	127.8	114.9	11.2	96.9	118.6	
	11/20/2015	93	Southeast crest	QC	128.7	117.0	10	98.7	118.6	
	11/20/2015	94	East crest	QC	127.6	116.0	10.5	97.8	118.6	
	11/20/2015	95	East slope	QC	127.1	115.0	8.9	97.0	118.6	
	11/20/2015	96	Southwest bottom	QC	126.3	113.4	11.2	95.6	118.6	
	11/20/2015	97	East center bottom	QC	128.3	115.7	11.4	97.6	118.6	
	11/11/2015	98	North end of west embankment of west side; 2 ft below final grade	QA	113.7	98.2	15.8	81.0	121.3	Failed; QC density tests after contractor reworked the area indicate acceptable dry density.
	11/11/2015	99	West end of south embankment of west side; 1 ft below final grade	QA	120.9	109.7	10.3	90.4	121.3	
	11/11/2015	100	East end of south embankment of west side; 1 ft below final grade	QA	131.7	119.8	9.9	99.6	120.3	
	11/11/2015	101	North end of east embankment of west side; 1 ft below final grade	QA	137.0	125.5	9.1	104.3	120.3	

Notes:

The compaction requirement is equal to or greater than 95 percent of the maximum dry density (specification 02200 Paragraph 3.4 C).

Locations of density testing are shown in Figure H-1.

Depth of testing was 12 inches for all density tests.

All density tests were conducted for Dinwoody material.

pcf = pounds per cubic foot
FG = finished grade
EDS = energy dissipation structure
FB= finished base
CL = centerline
BTE = below top elevation
QA = quality assurance
EG = existing grade
QC = quality control
SG = subgrade

Source: Final Pole Canyon Non-Time Critical Removal Action Construction Inspection Report (Formation 2017b).

Table H-2. Summary of Grain Size (Sieve) Analysis Results

Area/Location	GSA Test Location Identifier (for map Figure H-2)	Material Use	Sample Date	Type	Percent Passing				
					2 inch	0.5 inch	No. 8	No. 30	No. 200
Dinwoody borrow	1	Basin liner and embankment ODA Cover	3/11/2015	QA	100		96	91	84
Dinwoody borrow	2	Basin liner and embankment ODA Cover	3/11/2015	QA	100	95	85	69	55
Dinwoody borrow	3	Basin liner and embankment ODA Cover	3/11/2015	QA	100		91	76	62
Dinwoody borrow; south end stockpile	4	Basin liner and embankment ODA Cover	4/20/2015	QA	85	72	61	54	43
Dinwoody borrow; south sedimentation pond	5	Basin liner and embankment ODA Cover	4/20/2015	QA	98	94	86	75	58
Chert rind east slope ODA	6	ODA cover	4/25/2015	QA	70	48	30	21	16
Imported from Lancaster Pit; on-site stockpile	7	Pipe bedding	4/25/2015	QA	100	78	35	21	11
Dinwoody borrow south sediment basin embankment; south sedimentation pond	8	Basin liner and embankment	4/25/2015	QA	84	62	36	28	21
On-site stockpile from borrow pit run - Afton; on-site stockpile	9	Structural fill	7/6/2015	QA	96	51	25	16	10
East sedimentation basin	10	East basin embankment and ODA cover	7/6/2015	QA	100	84	57	47	33
On-site stockpile from borrow pit run - Afton; on-site stockpile	11	Drainage rock	7/6/2015	QA	98	1	1	1	0.5
Saddle infiltration basin north embankment	12	Pond Embankment	10/26/2015	QA	100	59	28	20	15
South sedimentation basin	13	West side	11/16/2015	QA	96	58	29	24	20
South sedimentation basin	14	West side	11/16/2015	QA	100	70	35	26	19

Notes:
Dinwoody material shall have a maximum particle size of 3 inches and between 20 and 70 percent fines passing the No. 200 sieve (specification 02200 Paragraph 2.4 A).
Material for use in compacted embankments will have a fines content passing the No. 200 sieve of between 10 and 50 percent by weight (specification 02200, Paragraph 2.1 A).
Locations of samples collected for grain size analysis testing are shown in Figure H-2.
psi = pounds per square inch
QC = quality control
QA = quality assurance
ODA = overburden disposal area
GSA = grain size analysis
Source: Final Pole Canyon Non-Time Critical Removal Action Construction Inspection Report (Formation 2017b).

Table H-3. Summary of Grout/Concrete Compressive Strength Testing Results

Location	Sample Date	Description	Material	Type	28-Day Compressive Strength (psi)
North haul road culvert riprap	10/22/2015	Grouted riprap	Grout	QC	7000
Pour from trucks; south central sedimentation basin access road swale	11/13/2015	Concrete mix from trucks	Concrete	QC	3500
Pour from trucks; south central sedimentation basin access road swale	11/13/2015	Concrete mix from trucks	Concrete	QA	4970
West sedimentation basin	12/3/2015	Grouted riprap	Grout	QC	5120
West sedimentation basin	12/3/2015	Grouted riprap	Grout	QA	5790
West sedimentation basin	12/3/2015	Grouted riprap	Grout	QC	5380
West sedimentation basin	12/3/2015	Grouted riprap	Grout	QA	4720

Notes:
The required 28-day compressive strength for structural concrete and grout is 4,000 psi or more (specification 3300, paragraph 2.6A).
psi = pounds per square inch
QC = quality control
QA = quality assurance
Source: Final Pole Canyon Non-Time Critical Removal Action Construction Inspection Report (Formation 2017b).

Table H-4. Summary of Laboratory Permeability Testing Results

Area/Location	Sample Date	Test Completion Date	Hydraulic Conductivity (cm/sec)	Maximum Dry Density (pcf)	Dry Density (pcf)	Percent of Maximum
Dinwoody Borrow North	3/3/2015	5/29/2015	4.80E-07	102.6	89.0	86.7
Dinwoody Borrow Center	3/3/2015	5/29/2015	4.70E-07	103.8	95.5	92.0
Dinwoody Borrow South	3/3/2015	5/29/2015	7.20E-07	107.9	95.7	88.7

Notes:

The performance standard for the Pole ODA cover system is 1 x 10^{-4} cm/sec (Appendix D of the Construction Inspection Report).
Locations of samples collected for laboratory permeability testing are shown in Figure H-2.
Samples were collected prior to development of the Dinwoody borrow area, and analyzed on the "test date" shown in the lab for permeability.
Materials are used for ODA cover, and pond and ditch linings.
cm/sec = centimeters per second
pcf = pounds per cubic foot
Source: Final Pole Canyon Non-Time Critical Removal Action Construction Inspection Report (Formation 2017b).

Table H-5. Summary of Atterberg Limits Testing Results

Area/Location	Sample Date	Test Date	Liquid Limit	Plastic Limit	Plasticity Index
Dinwoody Borrow North	3/3/2015	3/17/2015	44	22	22
Dinwoody Borrow Center	3/3/2015	3/17/2015	36	22	14
Dinwoody Borrow South	3/3/2015	3/17/2015	34	21	13

Notes:
The technical specifications do not include Atterberg Limits testing requirements for Dinwoody material.
Locations of samples collected for Atterberg Limits testing are shown in Figure H-2.
Samples were collected prior to development of the Dinwoody borrow area.
Materials are used for ODA cover, and pond and ditch linings.
Source: Final Pole Canyon Non-Time Critical Removal Action Construction Inspection Report (Formation 2017b).

Table H-6. Summary of Los Angeles Rock Abrasion Testing Results

Material Use	Test Date	Grading	Percent Lost
Shale riprap	6/30/2015	A	20
Limestone riprap	6/30/2015	A	24

Note:

The technical specifications do not include Los Angeles Rock Abrasion testing requirements for riprap.

Samples were obtained from on-site temporary stockpiles.

Source: Final Pole Canyon Non-Time Critical Removal Action Construction Inspection Report (Formation 2017b).

Table H-7. Summary of Field Permeability (Borehole Permeameter) Testing Results

Subarea (of Cover)	Subarea Area (acre)	Material Use	Test Date	Hydraulic Conductivity (cm/sec)
CU1	10.2	ODA cover	11/3/2015	3.43E-07
CU1 Prelim	10.2	ODA cover	6/16/2015	1.57E-06
CU2	10.1	ODA cover	10/8/2015	1.67E-07
CU3	10.6	ODA cover	11/3/2015	9.43E-06
CU4	9.9	ODA cover	11/3/2015	9.50E-08
CU5	10.6	ODA cover	11/3/2015	2.38E-07
CU6	10.6	ODA cover	10/22/2015	9.56E-07
CU7	11.5	ODA cover	11/24/2015	9.20E-08
CU8	7.2	ODA cover	11/25/2015	4.10E-07
CU9	10.1	ODA cover	11/24/2015	1.25E-06
CU10	11.1	ODA cover	11/24/2015	2.50E-07
CU11	10.1	ODA cover	10/8/2015	5.39E-06
CU12	9.5	ODA cover	11/3/2015	1.46E-06
CU13	13.9	ODA cover	11/25/2015	5.40E-07
			Geometric Mean =	**6.07E-07**

Notes:

The performance standard for the Pole ODA cover system is 1 x 10^{-4} cm/sec (Appendix D of the Construction Inspection Report).

Locations of borehole permeameter testing are shown in Figure H-3.

CU = cover unit

ODA = overburden disposal area

cm/sec = centimeter per second

Source: Final Pole Canyon Non-Time Critical Removal Action Construction Inspection Report (Formation 2017b).